PHYSIKALISCHES KOLLOQUIUM

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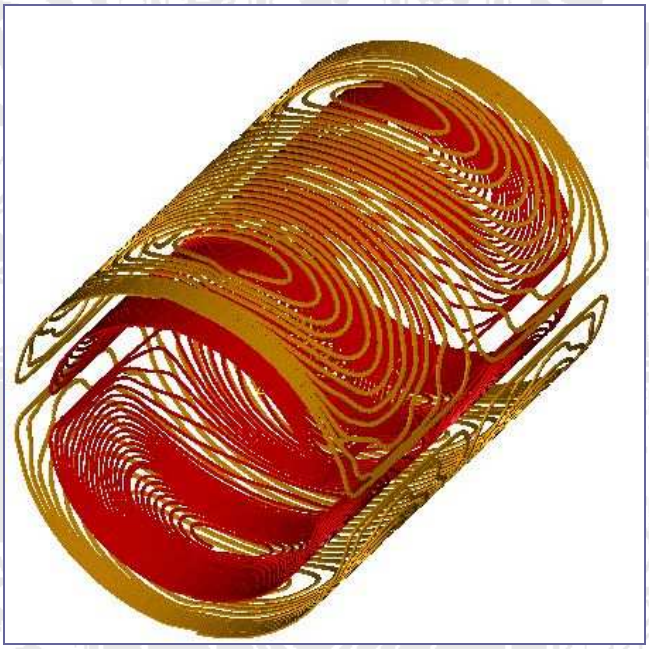

WORKING IN INDUSTRY AS A PHYSICST: HARDWARE DEVELOPMENT FOR MRI SCANNER

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Magnetic resonance imaging (MRI) has become one of the routine modalities for clinical imaging. It allows for excellent image contrast, especially in soft tissue, without applying any radiation to the patient.
MRI scanner comprises essentially four parts: the main magnet, providing a stable homogeneous magnetic field to align the proton spins; at least one RF coil sending and receiving at the Larmor frequency; some hardware to collect these signals and transform them into images; and a set of three gradient coils to superimpose magnetic fields to vary the magnetic field in three orthogonal directions. These superimposed fields encode the spatial information into the signal.
Optimization of these gradient coils is a multi-objective optimization problem, as there are many goals that shall be achieved, like linearity of the field, fast switching times of the gradient fields, high gradient field strength, etc. However, switching these gradient coils is not only essential for spatial encoding of the MR images, but induces also side effects, like e.g. acoustic noise. These side effects are due to the interaction of the gradient field and the magnetic field of the main magnet.
In this talk I will present the principles of gradient coil design, and the basics of the interaction of these gradient coils with the main magnet. Furthermore, this talk shall present the “typical range” of topics physicists have to deal with in industry.